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STOCK FEEDING SUGGESTIONS.

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STOCK FEEDING SUGGESTIONS.

By J. M. Bartlett.

The valuable ingredients in animal foods are ash or mineral matter, protein, fat and a class of compounds called carbohydrates, of which starch, sugar and crude fiber are the most important examples. Although the ash or mineral matter is essential to the well being of the animal, it is abundantly supplied by most materials one is likely to feed, so what one most needs to consider in buying and using cattle foods are protein, fat and carbohydrates.

A sufficient supply of protein in the food is indispensable. The working animal depends upon it to replenish and repair its working machinery, the growing animal to make muscle and build up its whole system, the sheep to make wool and the milch cow to make the casein and albumen of its milk. No other substance can take its place, or be manufactured into protein by the body. When more protein is fed than is needed for the growth and repair of the body, the excess performs the same functions as the fats and carbohydrates. As a rule, however, this is not an economical use to make of it. It is worth but slightly more than the carbohydrates and about six-tenths as much as fats for this purpose and is, commonly, the most expensive ingredient to produce or buy.

The office of the other two substances, fat and carbohydrates, is two-fold: First, they serve as fuel and are oxidized or burned in the body to supply heat and force. The fat is worth about two and one-fourth times as much as the carbohydrates for that purpose. Second, they are used as material for making fat.

For convenience in stating the relation of protein to carbohydrate material the term nutritive ratio is used. By nutritive ratio is meant the relative amount of digestible fat and carbohydrates compared with the digestible protein. That is, if a food is said to have a nutritive ratio of 1 to 6, that means that for every pound of digestible protein it contains six pounds of digestible carbohydrate material. To find the nutritive ratio, the digestible fat is multiplied by 2¼ and the product added to the carbohydrates.

This sum divided by the number of pounds of digestible protein, gives the number of pounds of carbohydrate material to one pound of protein.

It has been ascertained, by accurate experiment, that the amount of food required to keep an animal from losing weight is not materially different for different animals of the same size and species. All the food that they will *profitably* eat above that amount depends on their individual digestive and producing capacities. It is therefore evident, that a ration which would be profitable for one animal would not be for another, and no hard and fast rules can be made. For this reason the accuracy of feeding standards has been questioned by some feeders, but they certainly must be considered a vast improvement over the commonly practiced, haphazard feeding of any materials at hand. The successful and progressive feeder can, by studying his herd, learn the capacity of each animal and vary its ration from the standard to suit the individual.

The German feeding standards recommended by Wolff are the ones generally employed in this country when any standards are made use of. A so-called American standard for dairy cows, which was obtained by Woll, by means of extended correspondence with dairymen in all parts of the country and the use of averages for composition and digestibility of foods, gives a somewhat wider ration with a nutritive ratio of 1 : 6.9 and only 2.13 pounds digestible protein per day. This ration can hardly be said to be based on scientific data, and is probably too wide to give the best results in most cases. In fact some of our best dairymen in this State claim to derive the most profit from a ration having a nutritive ratio of about 1 : 4 which is much narrower than the German ration and perhaps cannot be continuously fed dairy cows with safety. Authorities quite generally agree that a one thousand pound cow, of average capacity for producing milk, should have about 2.5 pounds of digestible protein per day, and it would be questionable whether a Maine farmer, who is obliged to buy commercial fertilizers, could profitably feed any less to a cow of that size. At the present low prices of cotton-seed and gluten meals one can afford to feed the maximum amount of protein for the sake of increasing the value of the manure. Both of the above feeds contain fertilizing materials enough to amount to more than their cost when valued according to the valuations given to commercial fertilizers.

Explanation of Tables.

Below are given tables which furnish the necessary data for making up rations. In Table I the pounds of digestible nutrients in one hundred pounds of the coarse fodders and concentrated feeds common to this State will be found. In Table II some convenient mixtures of grain are given, together with their percentages of digestible nutrients and nutritive ratios. Those with very narrow nutritive ratios are designed for feeding with such coarse fodders as timothy hay, corn silage and corn stover; while those with the wider nutritive ratio are for feeding with leguminous coarse fodders like clover hay, peas and oats, soy beans, etc. Table III gives the German feeding standards.

How to Use the Tables.

The manner of using the tables can best be explained by an example. Suppose one wishes to make up a ration for dairy cows of 1,000 pounds live weight. For coarse fodders he has English hay and southern corn silage. By consulting Table III, he finds a cow of that size needs 2.5 pounds of digestible protein, 12.5 pounds of digestible carbohydrates and 0.4 pounds of digestible fat per day. The cow will readily eat 35 pounds of silage and 10 pounds of hay. In Table I he can find the percentages of digestible nutrients for southern corn silage and mixed hay. Those given for silage he multiplies by 35 and those given for hay by 10, which gives for

	Protein.	Carbohydrates.	Fat.
Southern corn silage	.36	2.77	.16
Mixed hay	.47	4.29	.13
Total.....	.83	7.06	.29

We see from the sum of these nutrients that about 1.7 pounds more of protein, 5.5 pounds of carbohydrates and 0.1 pound of fat are needed, which can be most easily supplied with concentrated foods. Suppose we take two pounds each of corn meal, cotton-seed meal, gluten meal and bran. Then the percentage of nutrients of each given in the table should be multiplied by 2 which will give us a ration of the following composition:

	Protein.	Carbohy.	Fat.
Southern corn silage, 35 lbs.....	.36	2.8	.16
Mixed hay, 10 "	.47	4.3	.13
Corn meal, 2 "	.12	1.2	.06
Cotton-seed meal, 2 "	.74	.37	.20
Gluten, 2 "	.67	.80	.11
Bran, 2 "	.25	.75	.06
Total.....	2.61	10.22	.72

TABLE I.

Pounds of Digestible Nutrients in 100 Pounds.

Coarse Fodders and Mill Products.	Protein.	Carbohydrates.	Fat.	Total Nutritive Substance.*	Nutritive Ratio.
Timothy	3.6	43.9	1.6	51.1	1:13.2
Red-top	4.9	45.2	1.3	53.0	1:9.8
Mixed hay (red-top, timothy & clover)	4.7	42.9	1.3	50.5	1:9.7
Hungarian	4.9	47.8	1.5	56.1	1:10.4
Orchard grass	4.9	40.6	1.4	48.7	1:8.9
Swale hay	2.4	29.5	0.8	33.7	1:13.0
Black grass	4.3	38.5	1.0	45.1	1:9.5
Oat hay	4.9	42.2	1.6	50.7	1:9.3
Oat straw	1.4	43.9	0.9	47.3	1:32.8
Corn stover	3.1	44.6	0.6	49.1	1:14.8
Maine field corn (mature including ears)	5.7	47.3	1.5	56.4	1:8.9
Maine field corn silage	1.8	13.6	0.7	17.0	1:8.4
Southern corn silage	1.0	7.9	0.4	9.8	1:8.8
Clover hay	7.2	35.8	1.8	47.1	1:5.5
Sweet corn fodder (no ears)	4.3	33.0	1.04	39.6	1:8.2
Corn meal	5.8	65.2	3.1	78.0	1:12.4
Wheat bran	12.6	37.5	3.2	57.3	1:3.5
Middlings	13.4	52.1	4.1	74.7	1:4.6
Ground oats	8.9	50.1	3.0	65.8	1:6.4
Barley	7.9	66.9	1.7	78.6	1:8.9
Pea meal	16.8	51.7	0.6	69.9	1:3.2
†Cottonseed meal	37.0	18.5	10.0	78.0	1:1.1
†Gluten meal (high in protein)	33.3	40.1	5.7	86.2	1:1.6
†Gluten meal (low in protein)	28.2	39.7	14.0	99.4	1:2.5
†Gluten feed	19.3	49.8	9.1	89.6	1:3.6
†Linseed meal	30.7	38.5	2.7	75.3	1:1.5

* Fat calculated to carbohydrate equivalent.

† These materials are subject to great variation in composition. The Feed Inspection Law now requires their composition to be stamped on the sacks, which guarantee the farmer can use, assuming the Protein to be 85 per cent. digestible.

TABLE II.—Grain Mixtures.

Mixture Nos.	Corn Meal.	Cotton Seed Meal.	Gluten Meal.	Gluten Feed.	Linseed Meal.	Wheat Bran.	Ground Oats.	Pea Meal.	Middlings.	Protein.	Carbo-hydrates.	Fat.	Nutritive Ratio.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	%	%	%	
1	200	.....	300	.....	.....	.....	.....	.....	.....	22.3	50.1	4.7	1:2.7
2	200	100	125	.....	.....	.....	.....	.....	.....	21.2	46.8	5.5	1:2.8
3	100	100	.....	100	.....	.....	.....	.....	.....	20.7	44.5	7.4	1:3.0
4	200	100	100	.....	.....	200	.....	.....	.....	17.9	44.0	4.7	1:3.1
5	100	.....	.....	.....	.....	200	.....	.....	.....	10.3	46.7	3.2	1:5.2
6	100	.....	100	.....	.....	100	.....	.....	.....	17.2	47.6	4.0	1:3.3
7	100	.....	.....	100	.....	.....	100	100	.....	12.7	54.2	4.0	1:5.0
8	100	100	.....	.....	.....	100	.....	.....	100	17.2	43.3	5.1	1:3.2
9	.....	.....	.....	.....	100	100	100	.....	.....	17.4	42.0	3.0	1:2.8
10	200	.....	.....	.....	100	.....	100	.....	.....	12.8	54.8	3.0	1:4.8
11	300	.....	100	.....	.....	100	.....	.....	.....	12.7	54.6	3.6	1:4.9
12	.....	.....	.....	.....	.....	100	100	100	.....	12.8	46.4	2.3	1:4.0

TABLE III.

Feeding Standards Per Day and Per 1000 Lbs. Live Weight.

	Nutritive (Digestible) Substances.			Total Nutritive Substance.	Nutritive ratio.
	Protein.	Carbohydrates.	Fat.		
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Oxen at rest in stalls	0.7	8.0	0.15	8.85	1:11.9
Oxen moderately worked	1.6	11.3	0.30	13.20	1:7.5
Oxen heavily worked	2.4	13.2	0.50	16.10	1:6.0
Horses lightly worked	1.5	9.5	0.40	11.40	1:6.9
Horses heavily worked	2.3	12.5	0.80	15.60	1:6.2
Milk cows	2.5	12.5	0.40	15.40	1:5.4
Fattening oxen	2.7	14.8	0.60	18.10	1:6.0
Fattening sheep	3.0	15.2	0.50	18.70	1:5.4
Growing cattle, age 3—6 months	3.2	13.5	1.0	17.7	1:4.9
" " age 6—12 months	2.5	13.5	0.6	16.6	1:6.0
" " age 12—18 months	2.0	13.0	0.4	15.4	1:7.0
" " 2 years and over	1.6	12.0	0.3	13.9	1:7.9

Rations per Day for 1000 lbs. Live Weight,

Made up from the Coarse Fodders and Grain Mixtures in Tables I and II.

Ration Number.	Materials and Weights used for Each Ration.	Digestible Nutrients.			Nutritive Ratio.
		Protein.	Carbohydrates.	Fat.	
1 Milch cows.	Flint corn silage (ears glazed) ...30 lbs. Timothy hay.....10 " Grain mixture No. 1..... 7 "	2.5	12.0	.70	1 to 5.4
2 Milch cows.	Flint corn silage (ears glazed)....30 lbs. Mixed hay.....10 " Grain mixture No. 2..... 7 "	2.5	11.7	.73	1 to 5.3
3 Milch cows.	Southern corn silage (no ears)....35 lbs. Mixed hay.....10 " Grain mixture No. 3..... 8 "	2.5	10.6	.86	1 to 5.0
4 Milch cows.	Timothy hay.....10 lbs. Corn stover.....10 " Grain mixture No. 4.....10 "	2.5	13.3	.69	1 to 5.9
5 Milch cows.	Hungarian hay .....10 lbs. Sweet corn fodder.....10 " Grain mixture No. 4..... 9 "	2.5	12.0	.67	1 to 5.4
6 Milch cows.	Clover hay .....20 lbs. Grain mixture No. 5.....10 "	2.5	11.8	.68	1 to 5.3
7 Oxen heavily worked.	Mixed hay..... 5 lbs. Oat hay..... 5 " Oat straw.....10 " Grain mixture No. 6. .....10 "	2.4	13.4	.64	1 to 6.2
8 Oxen moderately worked.	Southern corn silage .....20 lbs. Mixed hay..... 5 " Oat straw.....10 " Grain mixture No. 7 .....10 "	1.9	13.5	.64	1 to 7.9
9 Horses heavily worked.	Oat hay.....15 lbs. Grain mixture No. 10 .....12 "	2.3	12.9	.60	1 to 6.2
10 Horses moderately worked.	Timothy hay.....15 lbs. Grain mixture No. 11 .....12 "	2.1	13.1	.67	1 to 7.0
11 Young growing cattle.	Mixed hay.....20 lbs. Grain mixture No. 9. .....10 "	2.7	12.8	.86	1 to 5.5
12 Growing cattle.	Mixed hay.....10 lbs. Corn stover..... 5 " Southern corn silage.....15 " Grain mixture No. 12.....10 "	2.1	13.4	.45	1 to 6.4